Mushroom News

ISSUED QUARTERLY
Free to all Registered Mushroom Growers

Vol. VII No. 1 JULY 1958

Mushroom News

Vol VII No. 1 JULY, 1958

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OUR FRONT COVER

The composting yard on the new mushroom farm of Mr. A. M. Kirtlan, at Sompting, Sussex. After filling, the trays are taken into the pasteurising house, by the central door in the block of buildings. On either side of the pasteurising house are spawn-running houses, entered by doors at the opposite end of the block.

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Mushroom News

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WORTHING ENGLAND

Vol. VII No. 1 **JULY 1958**

THE tremendous flood of mushrooms that has deluged the principal markets during recent months has forced many growers to adopt the practice of selling direct to the public. By means of stalls in the town, stands at the side of main roads, or travelling shops visiting caravan and camping sites, they have managed to sell mushrooms at a price that has done something to counterbalance the very low returns obtained through salesmen.

Direct selling has brought home to them the indisputable fact that it is possible to sell mushrooms to the public in very large quantities provided the price is low enough. In other words, most people in this country like mushrooms, but do not buy them because they look on them as a luxury. Only when the grower sells direct to the housewife can both parties reckon that they have made a bargain.

Yet, for all the glut of mushrooms in the wholesale markets, there has been no apparent attempt by the retailer to increase his turnover of mushrooms. It is true that the retail price of mushrooms has been marked down in the shops, but that is as far as the retailer has gone. There has been no attempt to push sales by means of slogans such as "Mushrooms have never been cheaper" or "Enjoy mushrooms while you can!"

Publicity has concentrated on the housewife before she goes out shopping, by means of references in magazines and newspapers, and after she has made her purchase of mushrooms, by means of recipes. But there is no attempt to influence her at the point of sale, as her eye wanders over the goods on display in the greengrocer's shop. She sees a chip of mushrooms tucked away in a corner but her eye probably does not register the fact that good quality cups are selling at 1/- a quarter!

The motorist, seeing a large sign at the side of the road telling him that fresh mushrooms are for sale at 9d. or 1/- a quarter, will probably pull up and buy some, acting on impulse. He would have to visit a very large number of retailers' shops, even at the height of the glut, before any attempt was made to get him to buy mushrooms on impulse.

In brief, as things are to-day, anyone buying mushrooms has put the item down on a shopping list before leaving home. Impulse buying of mushrooms is almost non-existent. Yet it is exactly this impulse buying that could do so much to counteract

gluts, and give people the "mushroom habit", that will last the whole year round.

Publicity at the point of sale is something that every grower can do something about. If he is selling direct to the retailer, ask him to display prominently a notice that mushrooms are cheap. If he happens to be buying vegetables, he can pursuade the retailer to increase his turnover of mushrooms by taking advantage of the glut.

A time of glut should be an occasion when a much wider section of the public enjoys mushrooms. Roadside sales show that it can be done; let the campaign be carried into the shops and stores so that the glut can be turned into a wonderful opportunity to make people "mushroom-minded."

Notes and News

Point of View

A retailer is quoted in *The Grower* as saying 'I can sell all the mushrooms in my shop for 1/- a quarter, but if they go over that, demand is down by 50%. Growers should remember that the housewife looks at everything in the shop and makes her choice according to price. If she can get tomatoes at 1/- per lb. or eggs at 3d., you don't sell so many mushrooms.'

Annual Exhibition

The Mushroom Industry Exhibition and Conference will take place this year in the Public Rooms of the Town Hall at Bournemouth. The dates are the 1st and 2nd October.

Full details of the lectures to be given are not yet available, although it is known that two will be delivered, each followed by a discussion.

Headquarters of the M.G.A. will be at the Grand Hotel, and members who are thinking of attending are advised to book accommodation early as the hotels are full well into the late autumn.

Heart Attacks

According to Dr. M. A. Stahman of the University of Wisconsin, the effect of Fusarium wilt upon plants can be compared to a stroke or heart attack in humans. The Fusarium organism can invade the plant's vascular system and attack the pectin in the walls of the vessels by means of enzymes. The fragments of pectin then move into the vascular stream, forming clots, and just as blood clots block the vessels in human beings, so these gelatinised masses plug the conducting vessels of the plant.

Fusarium wilt is the cause of very heavy losses to farmers and growers in all parts of the globe, but the new knowledge has thrown considerable light on the causes of the trouble.

A Plastic Rose

A rose by any other name may smell as sweet, but the new plastic watering rose recently introduced certainly has a number of advantages over the brass roses widely used at present.

Virtually indestructible, the rose has no solder to break, and no joints to leak. It is mass produced, and will fit the ½-inch bore watering lance, whether tap or trigger. Its only disadvantage is that the spray is not quite so fine as can be obtained through a pierced metal plate, and the operator will have to move the rose slightly faster over the beds to deliver the same amount of water.

OPEN DAY at

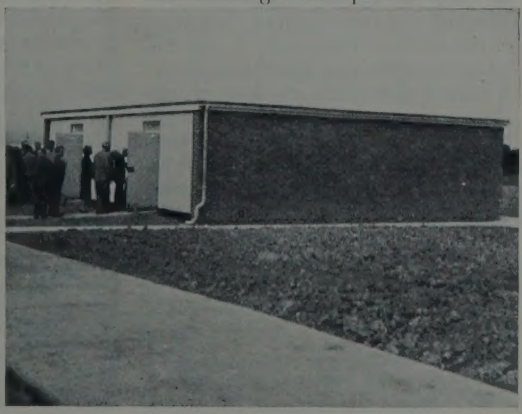
TODDINGTON

A visit to the Glasshouse Crops Research Institute 12th May, 1958

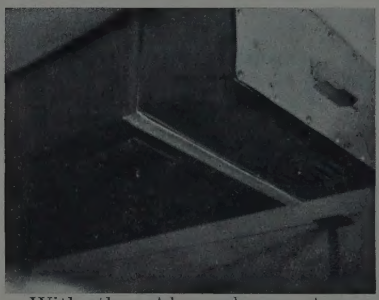
Members of the Mushroom Growers' Association were given a special Open Day at the Glasshouse Crops Research Institute at Toddington on the 12th May. It gave them the opportunity to see the experimental cropping houses and laboratories now in use, and to meet members of the staff specialising in mushroom research.

It was natural that the attention of growers should be focussed on the new buildings when a special Open Day for members of the Mushroom Growers' Association was held at the Glasshouse Crops Research Institute on the 12th May. The prospect of seeing the latest ideas in mushroom house construction, coupled with finding out what was going on in mushroom research attracted growers from all parts of the country.

Welcoming the members, the Director, Mr. F. W. Toovey said that it was not proposed to give mushroom growers a special day of their own as a regular feature of the programme. However, at the special request of the M.G.A. Research Committee, headed by Mr. F. C. Atkins, he had agreed to give members a day of their own so that they would be able to inspect the new buildings thoroughly and question those of his staff who concentrated mainly on mushroom growers' problems.



Two new cropping units opened for inspection by visitors to the G.C.R.I.



The stainless steel ventilation ducts that run down the centre of each cropping unit at ceiling height.

With the old mushroom house, taken to Toddington from Cheshunt, the total bed area available for experimental cropping now totals 2,000 square feet. The two new houses, which are adjacent, each measure 31 feet 6 inches by 15 feet 6 inches. They are of unusual construction and Mr. Toovey pointed out that while growers might consider them elaborate—even luxurious by commercial standards—they must remember that the houses are designed for *research* work. Research demands exact control of conditions within the house, no matter what the weather is outside or the season of the year.

There is no doubt that a great deal of very careful planning has gone into the construction and equipping of the houses. There were many discussions, with advice taken from the National Institute of Agricultural Engineering, and also from mushroom growers themselves by consultation with the growers' Research Committee. Careful planning paid off, for when the houses came to be built, the work went ahead at remarkable speed and there were none of the usual delays that attend building against half-completed planning.

Mr. F. C. Atkins chats with Mr. G. Reed. The old Cheshunt house can be seen in the background.

The houses are heated by low pressure steam, the system being thermostatically controlled and yielding a maximum temperature of 160° Farenheit. Live steam can be tapped off the main for injecting into the houses during peak heating, for raising humidity during cropping and for cooking out. Ventilation is by stainless steel ducting and fans, the box-shaped ducting running down the centre of the houses at ceiling level, discharging air through louvres. The incoming air can be heated and humidified as required, and the system allows for recirculation.

The new houses contain steel framework to take trays in open-stacking, individual trays measuring 3 feet by 2 feet, although there were much smaller trays on view for special experiments. In the old Cheshunt house, however, shelf beds are still cropped, together with room for individual trials in large diameter pots.

Miss D. G. Gandy and Mr. P. B. Flegg have been given the new houses in which to carry on their work into diseases of mushrooms and the study of environmental

A corner of Miss Gandy's field laboratory, with her assistant examining cultures under a microscope.

control. Miss Gandy is concentrating upon that complex of symptoms called "Brown Disease" or "Watery Stipe" or sometimes "la France". In her small field laboratory growers could see photographs of mushrooms attacked by the troubles, and also a collection of cultures made from diseased mushrooms showing how the mycelium varied from that found in healthy crops. Slides could also be seen under the microscope in which sections taken from diseased mushrooms had been attacked by bacteria.

Mr. Flegg continues his studies into the casing layer of the mushroom bed. Various salts have been added to the casing material, and in some cases increased cropping has resulted, although it is impossible at this stage in the basic research to form any conclusive opinions. The primary purpose of this line of research is to discover just what the casing layer does in mushroom cultivation rather than to find any methods of increasing mushroom crops or issue directives to growers as to what they should use to case their beds.

The pests of mushrooms are the special care of Dr. N. W. Hussey and his colleague Mr. I. J. Wyatt. At the moment they are concentrating on the paedogenesis of Cecids and while their work tends to be overlooked by mushroom growers in view of the emphasis today on the threat to the mushroom industry of "Watery Stipe", it must not be forgotten that barely two years ago it was the attacks of Cecid larvae that gave growers their biggest headache.

Of more immediate interest to growers is Mr. W. H. Read's work on insecticides, and they could see charts showing the persistence of insecticides such as gammexane, diazinon, aldrin and D.D.T. in mushroom composts after peak-heating and cropping, and also their effects upon the crops yielded by treated composts.

In addition to the two new mushroom houses there is a large, covered composting area measuring 69 feet by 24 feet, with a smooth, sloping concrete floor to facilitate washing down. Attached to the composting shed are two storerooms, including spaces for mixing casing materials under cover and away from contamination. Also, in the same block, are two small, field laboratories, one for Miss Gandy and the other for Mr. Flegg.

Growers who attended the Open Day must agree with Mr. Toovey when he claimed that the mushroom industry now has a research team equal to any in the world. The gap created by the closing of Yaxley and filled by the work of commercial firms, has now been closed. At Toddington there is not only a special team of experts in mushroom research, but there is also a far greater team of research workers whose experience can be called upon when necessary to tackle specific aspects of research studies.

"Once it is allowed to become well established, Cobweb Disease rapidly becomes epidemic . . . . "

COBWEB DISEASE

Dactylium dendroides

= Hyphomyces roseellus

by

F. C. WOOD, B.A. (Cantab)

ONE of the most infectious mushroom diseases is that known to growers as "Cobweb Disease" or "Mildew", and wherever intensive mushroom cultivation is practised it is fortunate if this trouble does not make its appearance sooner or later.

Once it is allowed to become well established Cobweb Disease rapidly becomes epidemic, not only causing heavy losses in the crop attacked but also becoming scattered all over the mushroom farm so that the danger of a carry over from one crop to another is always present. Where a heavy infection is followed by insufficient care it may take months or even years to eliminate Cobweb Disease from the farm.

A Fungus Disease

The disease is caused by a fungus *Dactylium dendroides* which is parasitic on growing mushrooms. It usually appears as small white powdery patches on the casing soil which spread into a white cobwebby mycelium which attacks and spreads over any mushrooms nearby. (*See Fig.* 1). These become enveloped in a downy fluffy mould under which the mushroom decomposes with rapidity (sometimes overnight). A pink pigment is often produced in the affected mass and enormous numbers of spores appear on the mycelium. Under the microscope these are mostly four-celled when ripe (*see Fig.* 2) and, to quote L. Matruchot(1) ". . . the fully-developed spore looks like a little cylindrical sausage, rounded at both ends and partitioned off into four compartments . . .". They blow about in the slightest air movement and spread the disease, the rapidity of spread being due not only to the prolific spore production but also to the exceedingly short time necessary between the original infection, complete development, and germination of the scattered spores. The minimum temperature at which *Dactylium* will grow is about 48°F. The optimum temperature for growth is about 77-80°F. It should be remembered therefore that while low temperatures in the mushroom house will not check the growth of *Dactylium* they do provide conditions where less watering and more gentle air movements can be provided than would be required at the higher temperatures. Since both frequent watering and rapid air currents can be active agents in spreading *Dactylium*, a lowering of the temperature of the mushroom house can be of

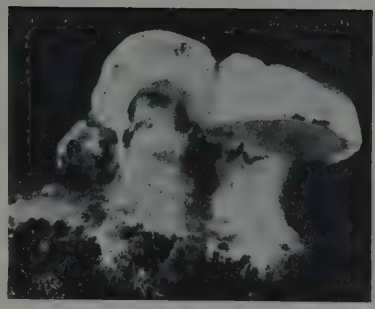


Fig. 1. Mushrooms attacked by Cobweb Disease.

considerable help when control measures are put into operation.

In addition to the type of spores described (known as "conidia" to mycologists), *Dactylium* also produces brown resting bodies described by Matruchot as *sclerotia.* These are much more resistant to adverse conditions and have greatly thickened cell walls as compared with the thin-walled conidia. They serve to ensure the survival of the disease under unfavourable conditions.

Investigated in 1860

Again quoting Matruchot, ". . . the parasitic fungus causing 'la *Mole* rose' was called *Dactylium dendroides* by the Swedish botanist Fries. This *Dactylium dendroides*, met with many times by Fries on rotting Agarics, had . . . been studied in 1860 by the French mycologist Tulasne who first consigned it to the Ascomycete genus *Hypomyces* and to the species *Hypomyces rosellus*".

Found in Nature

In nature *Dactylium* is found growing as a parasite on a variety of wild fungi such as, for example, the toadstools *Russula, Lactarius, Polyporus*, etc., and it is one particular spore form of the fungus *Hypomyces rosellus* belonging to the group of fungi known as the Ascomycetes.

Factors determining growth

Matruchot made observations on the growth of Cobweb disease and said it was determined by two factors. The age of the mushrooms exerts a considerable influence and he found that young 'button' mushrooms in a half-developed stage, possessing a high moisture content and very often having a film of moisture on the cap, provided a much better growing medium than the older fruit bodies. (This may possibly be due to the formation in the older fruit bodies of substances antagonistic to *Dactylium* which have not been fully produced in the the immature mushrooms. Antibiotics such as *psalliotin* and *campestrin* have been isolated from various mushroom species).

The second factor was that the virulence of *Dactylium* varies. Matruchot also showed that on artificial culture media *Dactylium* rapidly lost its virulence and its rapid rate of growth and this loss of vigour and the capacity to parasitise mushrooms became more and more pronounced the longer the culture was kept.

Optimum Conditions

Experiments carried out in our laboratories(2) showed that the production of red pigment similar to that produced on growing mushrooms was most readily formed when the medium showed a reaction pH = 6.2 at 60°F. (Living mushroom tissue has an approximate reaction pH = 6.3). They also showed that *Dactylium dendroides* has a marked tolerance for alkaline conditions. The practice of some growers to scatter lime over infected casing in the mistaken idea that it discourages the growth of the parasite has therefore little to recommend it.

Thermal deathpoint

Further laboratory experiments carried out on the question of what temperatures *Dactylium dendroides* will withstand showed that the fungus is completely killed by exposure for some 30 minutes to temperatures ranging from 115°F. to 120°F. The important thing from consideration of this thermal deathpoint is that where manure is properly composted it is extremely unlikely that this medium is responsible for introducing the disease into the mushroom house. The temperatures mentioned are greatly exceeded during normal composting and peak-heating and these results bear out the contention that the casing soil (in the case of peat casing) or contact with infected soil is the most likely way in which the disease was first introduced into the mushroom house. From such an original focal point of infection the whole house and the whole farm can become contaminated.

Methods of Control

The longer the lapse of time before infection is noticed the harder it is to eradicate the disease. At the first signs of the appearance of any mould patches resembling *Dactylium* on the casing therefore, immediate action should be taken.

Various materials have been suggested from time to time for "spot" treatment of infected areas. Those that have proved reasonably effective are:

(a) bleaching powder;
(b) common salt;
(c) 20% P.C.N.B.

Of the three materials bleaching powder is the least attractive from a practical point of view. It is a powder which rapidly becomes caked and moist on exposure to the air and it is very soon hard to apply evenly, and wasteful in use. Moreover, it is caustic to the skin and is poisonous to mushroom spawn.

Common salt treatment has much to commend it as a temporary measure at any rate. It is easily obtainable, non-poisonous, easily and quickly scattered and usually does little harm to the spawn in the casing. Treatment consists in scattering salt evenly and fairly thickly over all infected areas. Although it is impossible that all the infection in the area will be completely killed, the treatment effectively immobilises the spread from that area for up to 24 hours. One man can thus be detailed to go round the whole farm on arrival, to treat all suspected infections with salt and these areas can then be removed later by taking off the complete infection with a flat trowel and placing it in a bucket of strong disinfectant solution.

The use of 20% P.C.N.B. dust is the latest and best method of *Dactylium* control, and can be used, following the salt treatment, as an effective completion of the control. The beds should be dusted at the rate of 8 ozs. 20% P.C.N.B. per 1,000 square feet of bed space, at 7-day intervals until control has been obtained. Dusting can then be reduced to 4 ozs. per 1,000 square feet applied every 14 days. Should infected patches reappear P.C.N.B. can be used as an individual "spot" treatment, using a hand duster for the purpose.

Mushroom spawn shows a good deal of tolerance to P.C.N.B. dust. Also it has been shown[3] that if this dust is applied at the correct dosage and following a commonsense cultural routine, viz., dusting *after* hard picking and *before* watering, there is little likelihood of tainting.

It should be remembered that attention to altering the cultural conditions where necessary, is as important as direct action with fungicides: if the former is not done, full results cannot be expected from the latter. The highly infectious nature of the disease should be stressed and houses where the trouble has appeared should be kept locked so that the picking staff do not go indiscriminately from infected houses to 'clean' ones. Spores of the disease can be spread by contact with clothes, picking baskets, tools, and particularly by fly pests. On large scale farms working on a tight schedule it might well be policy to cook out a heavily infested house immediately. Cooking out should, in any case, be made an essential part of the farm routine and it is important to remember that treatment of the *floor* of the house with disinfectant before raising the house temperature is essential. Whatever the auxiliary heating used, the floor (whether it be earth or concrete) rarely, if ever, reaches temperatures that are lethal. Spores, etc., drift naturally to the floor so that it is quite possible to cook out the *beds* efficiently while leaving the floor still infected and a potential source of trouble as soon as the doors are opened after cooking out.

Preventative measures should also be put in hand as new houses are put down. An efficient peak-heat should mean that the houses are *Dactylium*-free up to the time of casing. Since this latter medium may have picked up infection from the farm, it should be dusted immediately after the casing operation, using 20% P.C.N.B. dust at the rate of 4 ozs. per 1,000 square feet of bed space. Dusting should be carried out once a week until cropping begins and after that a maintenance dosage once a fortnight should be given. Dust between flushes, after heavy picking, and *before* watering to avoid heavy deposits of the dust sticking to the wet caps of the mushrooms.

As will be noted from the references the French mycologist, L. Matruchot, was writing of *Dactylium dendroides* as a major disease in the French mushroom industry in 1914, so that this trouble has been causing losses for some 50 years. It persists in Nature on wild mushrooms and toadstools and the spores blow about and remain in the soil. Here they probably produce, in due course, resting resistant sclerotia. In this laboratory mycelial cultures have remained alive when stored under liquid paraffin oil for six years and have produced a typical *Dactylium* growth when subcultured.

References:

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L. Matruchot " La Môle Rose ".
(2) Mushroom News, Vol. III, No. 3, pp. 55-57, 1951.
(3) Wood, F. C., Mushroom News, Vol. VI, No. 5 pp. 256-7, 1957.

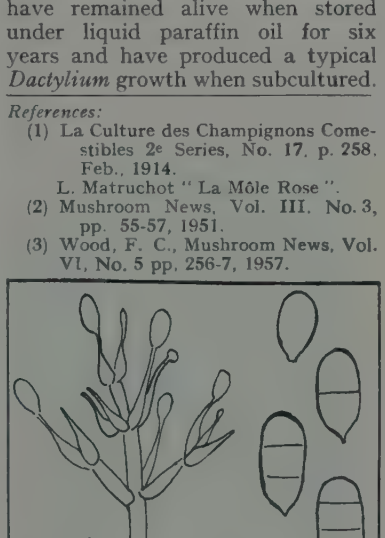


Fig. 2. Dactylium dendroides. A. Mycelium with spores x 250. B. Stages in spore development x 675.

PESTS of the CULT

No. 2—The Road to Follow M

The first of Martin D. Austin's articles on the pests of the cultivated mushroom was published in "Mushroom News" Vol, VI No. 7 *and in it he outlined the problems that confronted the mushroom grower in the field of pest control. In this article he outlines the basic principals of prevention that should be followed by the mushroom grower if he is to avoid serious trouble, and he will follow with further articles dealing with individual pests, in future issues of the journal.*

THERE is no short cut to success in this important matter of mushroom pest control, particularly as there are so many biologic factors involved and, as already noted, an almost continuous vulnerability of both crop and site to pest reinfestations.

To achieve success, a commercial mushroom grower should not only have a soundly-based pest control programme but it should permit of a degree of flexibility so that fresh pest outbreaks can be dealt with as they occur.

Even when rewarded with completely satisfactory commercial control—relative freedom from certain pests—during the whole of the life of a cropping unit, success is not something acquired in perpetuity! Rather, as each cropping unit is repeatedly utilised, the pest problems have again to be tackled from the very beginning.

To be realistic and worthwhile, any attempts to control mushroom pests must be broad-based and governed by reasoning derived from one's own experience, or that of others, as well as by reference to the probing and proven results of controlled experiment and research. In this manner the practical approach to pest control will then be unobscured by recourse to 'panic' measures.

Concrete roads, bins for waste disposal, no unkempt corners, these are the marks of a clean farm.

VATED USHROOM

by

Martin D. Austin

Since it is almost universally accepted that sooner or later pests inevitably invade even the most ideally organised commercial mushroom growing set-up the logical first steps in their control should be preventative. That is, no effort should be spared in attempting to reduce the numbers of pests invading compost and site, from whence they may later move to the crop itself.

Preventative measures must be considered as an essential part of *routine*. Further, these measures should be sustained. Thus the early chemical treatment of the incoming manure, or of the compost at one of its intermediate stages could be of some importance, although the most important period so to treat the compost is at the final 'turning' operation.

One is sometimes tempted to ascribe many of the pest invasions as being solely associated with the incoming manure as it reaches the farm. Incoming manure is usually relatively free of pests but it can rapidly become infested *after* reaching the site!

We make no excuse at this point in stressing that today, with an apparently ever-extending range of chemicals and formulations for use against mushroom pests, the degree of pest control is sometimes so high, and often so certain of achievement, that the emphasis is more frequently on when to use a particular type of chemical, and how often, rather than on what type to use!

The general result of this control 'by the book' sometimes has resulted in a considerable neglect of other and well proven subsidiary control measures—more especially as it concerns correct composting and hygiene in and around the mushroom unit.

The importance of waste disposal is of great significance since the presence of discarded, broken, undersized, pest- or disease-affected mushrooms and the ends of stalks is very considerable. Far too frequently quite massive accumulations of this sort of mushroom waste remain forgotten for lengthy periods. Its satisfactory and *total* disposal should be a *permanent* part of general routine: not something to be attended to when time permits. The economy of the farm demands a very high standard of hygiene in this regard.

In areas traditionally associated with intensive glasshouse and market garden crop production, and where mushrooms thus form but a

part of the whole cropping set-up, the site-contamination factor may be considerable in that even those units where there is a scrupulous regard for hygiene may be continuously exposed to pest reinfestations from outside sources.

In the past, instances of devastating and widespread troubles within mushroom units may well have been largely brought about solely because of the intense nature of the industry within a particular area.

Since in practice there is a good deal of concentration of the mushroom industry the benefits of site isolation are not universally enjoyed. However, be that as it may, the intrinsic value of isolation still possible in many areas does not by any means imply that site contamination cannot occur. In fact gross contamination is initiated and encouraged wherever the standards of hygiene go by the board.

In actual practice pest perpetuation may unwittingly become an established part of routine since this particular 'fifth columnist' may be largely unsuspected when it first intrudes, and, increasing so imperceptibly even in its later gross stages, is still unnoticed!

The 'spent' compost from cropped-out units, for which, fortunately, many growers have a ready and worthwhile commercially economic outlet well away from the farm, can in certain circumstances be a real source of trouble in so far as 'end-of-cropping' pests may well have accumulated considerably.

Even quite cursory examination of this worked-out compost, together with its casing material, may reveal the presence of such pests as mites, springtails, fly larvae, eelworms and the like.

Its speedy removal from the site is therefore essential: any temptation to accumulate it over a considerable period should be firmly resisted despite its own particular position in the ancillary economic structure of the farm.

Proper regard to hygiene demands that, after cropping, each unit should be subjected to a 'cooking-out' process by steam heat and/or the liberal but regulated use of appropriate sterilizing chemicals. In this connection *all* of the interior of the building concerned, including the walls, ceiling and particularly the floor and pathways should receive treatment.

Each unit as it is cleansed should ensure that no remains of the previous organic cropping set-up are present.

During the cropping period the filling in of the shallow cavities in the casing brought about during the picking of successive crop flushes must be a matter of routine. These cavities are not only convenient sites for the egg-laying of such pests as Sciarids and Phorids but the exposure of the mycelial mass and the liberation of the typically mushroom odour consequent on picking, all serve to attract the typically very mobile fly pests. In practice the use at this time, of insecticides such as nicotine or BHC is necessary to control fly species.

The supplementary preventative practice of screening vents to reduce the risks of flies invading the units during the cropping period has much to commend it, but nevertheless must not compromise adequate ventilation. Such screening, with certain materials including fine mesh gauze or muslin-type fabrics, must be carefully considered and arranged. However, appropriate

Double doors, the inner being screened with muslin to prevent flies entering, are found on this farm at Corfe Mullen.

screening and the use of double doors designed to the same end are extremely worthwhile and supplementary to hygiene with which we are here concerned.

In the same way the steam or chemical treatment with formaldehyde of cropping trays and shelves as well as all structural timber is supplementary but essential to our general interpretation of this important matter of hygiene.

As far as the whole of the site is concerned, we would emphasise that there should be no *uncontrolled* areas. The packing shed itself should be scrupulously clean with no accumulation of organic material such as mushroom stalk trimmings.

The building used for the intake of fresh manure should be capable of easy cleaning so that at *no time* shall there be any accumulations, either in odd corners or exposed outside, of manure from one intake to another.

In short, if hygiene is to mean anything really worthwhile on the farm, it should, within the limits of reasonableness, be practised universally.

Whilst hygiene by itself does not confer immunity from pest, and for that matter disease, outbreaks in the cropping units, when geared to a well planned chemical control routine it assumes significance indeed. We feel that in an account such as this it would be unwise to ignore this important part of commercial mushroom growing routine.

So too we feel that emphasis on routine is necessary since considered from a strictly economic view-point the control of insect and allied pests of mushrooms is soundly based only when we pay some regard to the maxim 'Prevention is better than cure'.

The use of chemicals, as a matter of routine, must be related to some specific cultural or biological 'landmark' such as the peak-heating climax when the judicious use of certain chemical control measures, particularly fumigation, speedily eliminates any pests present. At this time they are likely in the aggregate to be forced to the surface and thus are extremely susceptible to control measures.

In this connection the casing medium, particularly if it is soil, may profitably be treated with a sterilizing agent such as formaldehyde before being used: and an insecticide such as a Nicotine dust used periodically from spawning, but not after cropping commences.

Similarly, as a part of the routine approach to pest control, specific measures should be employed against the known or expected presence of certain pests for which one or more of a unique range of chemicals in the form of sprays, dusts, aerosols, smokes and fumigants are available.

Although generally control measures used as routine adequately deal with normal pest occurrence the control programme itself should allow of some flexibility, since occasionally an apparent sudden attack of some pests occur. This

'suddenness' is however usually but an obvious manifestation of a state of affairs towards which pest numbers have been gradually or even rapidly mounting. Witness the 'out of the blue' attacks of certain eelworm species which sometimes are not noted until cropping output steeply and suddenly falls or when the depressing influence of a massive population of Cecid larvae within a unit becomes only too obvious. In both instances the 'sudden' nature of an attack is thrust upon our attention because of the extreme rapidity in which the life-cycle of these pests is completed, and, consequently generation follows generation so quickly that sooner or later as the pest numbers build-up, serious damage is suddenly apparent. In the case of many eelworms the life-cycle is always very brief: with certain Cecids their larvae themselves produce other larvae and thus considerably short-circuit the complex egg-larva-pupa-adult cycle!

Nevertheless since as a general rule routine control measures pay off well the routine itself should be strictly adhered to even when pest populations are at very *low* levels.

However where this rule is well followed, and the chemicals employed are invariably the same, season after season, it might happen that some form of resistance or tolerance towards a particular chemical could be built up within a pest species. Whether this is a risk more apparent than real some growers nevertheless 'ring the changes' within a selected group of chemicals commonly employed.

Resistance was the subject of an article in a recent issue of *Mushroom News* and is well worth re-reading.

When committed to a chemical control programme the use of all such materials should be as per maker's instructions since they, and usually they alone, have carried out the necessary and protracted research work involved before a new formulation is launched.

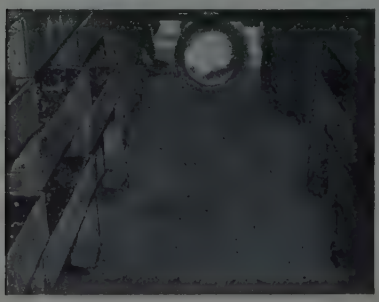
These instructions or recommendations may relate to the exact time in which a particular chemical can be safely employed: whether it can be used during cropping, between flushes and the like.

Above all the data with reference to the dosage—the concentration—rate must be closely followed.

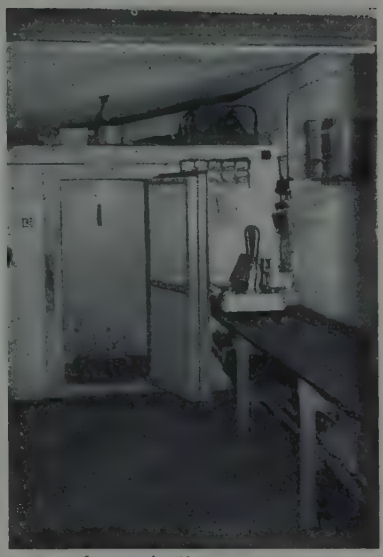
Similarly where a chemical comes within the scope of the 'Agricultural (Poisonous Substances) Act, 1952' the regulations concerning its use must be observed.

Further, since it is possible that some materials when used at the incorrect time may have injurious or unsightly residual effects on the crop, any recommendations given to avoid this must naturally be followed.

Finally, in our general consideration regarding pest control we must briefly refer to the buildings within which mushrooms are grown. Whatever type of building is concerned, whether it has been specially designed and constructed for the



Sterilisation after cropping by cooking out with a Heat Sterilizer Unit.



The packing shed may be a source of re-infection. It should be spotlessly clean and easily disinfected.

purpose, or whether it has been converted to conform to some suitable standard, it should be possible to carry out efficient pest control operations within. For instance, where a control measure depends for its success on its fumigant effect it is obvious if this is to be exploited to the full that the building shall conform to the basic requirements of fumigation—absence of any leaking risks. In fairness to the manufacturer, and also to the grower himself, a particular chemical or a special mode of use should not be permanently discarded because of an inherent defect in building design or repair.

Later, as our main account unfolds, it will be seen that since some chemicals commonly employed effectively deal with more than one kind of mushroom pest, and that routine measures do not imply the continuous use of specific chemicals, control of pests is something within the range of practicality.

As to the pest species, these will be discussed in turn, special reference then being made to their biology, the damage they cause, and their control.

PIG MANURE

A Report from Denmark

C. R. Rasmussen of the Royal Agricultural Station, Copenhagen, has now revealed some of the results of his work upon pig manure as a basis for mushroom composts.

The study is of great importance to a country such as Denmark, which has a vast number of pigs and very few horses. First results of the four-year programme suggest that pig manure, properly composted, will give better yields than synthetic composts, and at times, better than horse manure.

Experiments demonstrated the importance of keeping the compost heaps open, for the pig manure tends to pack down into a solid mass, with consequent anaerobic fermentation. Only the sides of the 4-foot wide stacks are very lightly pressed with the manure fork, the centre is kept as open as possible.

Mr. Rasmussen's best crop from pig manure was 3.7 lb. per square foot in 90 days, the weight including stalks and roots. Looking to the future, he considers that pig manure will never be more than a substitute for horse manure, but it is cheaper and better than alternatives already available.

"The swift swing to Capelle Desprez, and the concentration to only a few varieties is a new feature of cereal farming in Britain, and is not likely to be reversed".

CAPELLE WHEAT

by

Bernard Roberts, B.Sc. (Agric)

Mushroom growers, and all horticulturalists who need to make compost, have noticed recently that an increasingly high proportion of wheat straw is short and characterised by pithy stems. Much of it is from the variety 'Cappelle Desprez'. The following article describes how this wheat became popular and points out that this trend reflects a significant advance in British farming.

IN their search for greater efficiency, British farmers have been turning their attention more and more in recent years to the problem of crop yield. Their success is reflected in the phenomenal increases in average yields of grain, of sugar beet and of potatoes, which have taken place in the last 20 years, far surpassing the increases achieved over more than double this period hitherto. Wheat yields, for instance, are today 43 per cent above pre-war; barley yields are up by 45 per cent; sugar beet and potatoes up by 37 and 12 per cent respectively.

The search for higher yields has led farmers not only to the chemist and fertiliser manufacturer, but also to the plant breeder. After decades between the wars, when such sturdy British names as 'Yeomen', 'Holdfast', 'Squareheads Master' and the like described the wheats which were then grown, some enterprising farmers shipped the channel to pick the brains of the French seedsmen.

They went to the House of Vilmorin, the doyen of French farm seed firms, with its Headquarters in the centre of Paris, looking out across the Seine to Notre Dame. And they found, too, some remarkable breeds of wheat, which soon began to find their way on to British farms. One of these breeds is 'Capelle Desprez'.

A highly-yielding wheat must not only have the capacity to produce heavy heads of grain, it must have a straw which is stiff enough to hold the heavy ear erect and stand up to the buffeting of the weather.

Breeding can only produce a plant *capable* of high yields. It is in the hands of the farmer to *achieve* the best yield, and he can only do this by sound cultivations and using sufficient fertiliser. But heavy fertilisation tends to lengthen and weaken the straw—yet another reason why the strength of the straw is such a vital necessity in a high yielding wheat.

Cappelle Desprez meets every test with flying colours. More than any other variety since the war it has caught farmers' imaginations and achieved a popularity never before known by a single wheat variety.

Like a pedigree mare its ancestry is carefully recorded: by Hybride du Joncquois (Desprez 80) out of Vilmorin 27, bred by Desprez, in France. Qualities (vide recommendations by the National Institute of Agricultural Botany, Cambridge): "Very heavy yielding, with very

short stiff straw, suitable for a wide range of conditions. Liable to be attacked by yellow rust. Recommended for general use". This latter point is important for in the old days the heavy yielding varieties needed excellent soil conditions to give of their best. Cappelle Desprez will yield heavily on most soils if management is up to the mark.

Listen, now, to the report of trials on modern winter wheat varieties carried out by the Edinburgh and East of Scotland College of Agriculture on farms in the Lothians. "Cappelle Desprez was significantly superior to all the other varieties except N 59 in average grain yield", (though its average yield did, in effect, top that of N 59 by some 2 cwt.) Cappelle Desprez was, in addition, superior in each of the three areas where trials were carried out.

Its overall average yield was 38.8 cwts. per acre, almost 60 per cent more than the average wheat yield for all farms in Britain. In straw strength it was well above the average of even the superior wheats with which it was being compared.

Its average length—38.6 inches—was seven to eight inches shorter than the next shortest straw and ten inches shorter than any other.

Herein lies its strength; and also in the pithy nature of the straw, which indicates that it has in its ancestry the strain of 'Triticum turgidum' (Triticum is the family name for wheat among botanists), one of the European cousins of our own wheats and noted for its pithy stem.

The French breeders are to be congratulated on their perseverance in attaining this union of ideals—in addition, Cappelle is among the first of wheats to ripen, which is a boon in a wet harvest—and it is likely that the present popularity of this variety, or something very like it, will continue to grow.

At present there is no sure way of calculating the relative acreages of different varieties of cereals grown, but an indication is given by the relative numbers of samples of the different kinds which are sent to the national Institute of Agricultural Botany by farmers and seedsmen for germination tests.

Cappelle's record in these statistics is phenomenal. First recommended only in 1953, it accounted for about 4 per cent of the samples submitted in that year. Four years later, in 1956-57, the proportion had grown seven times. Twenty-nine per cent of the samples for that year were Cappelle Desprez; the next most popular variety netted only 6 per cent, and there were only 3 other varieties with more than 1 per cent each, whereas four years before the total was split between as many as sixteen contestants. Never before had any single variety achieved a relative popularity of more than 12 per cent.

The swift swing to Cappelle Desprez, and the concentration to only a few varieties is a new feature of cereal farming in Britain, and is not likely to be reversed. Let us hope that it reflects a little the success of advice and publicity among farmers; a signal, perhaps, that barriers to progress in food production are breaking down. For this simplification, spread to other branches of crop and livestock production, could mean more food, and cheaper food; a better life for the farmers and farm workers, and more money to spend on the luxuries of life—of which mushrooms are but a sample.

ROUND AND ABOUT

A WESSEX FARM

Mr. John Scrimgeour is already well known to mushroom growers, many of whom he visited for his series "Modern Mushroom Farms" *in* "Mushroom News". *Now the tables have turned and we publish below an account of a visit to his farm where many things of interest to growers will be found.*

HUNTICK FARM lies on the fringe of the Hardy country, seven miles as the crow flies from Wool Manor, and from the front door of the old farmhouse one can see right across the broad stretch of Poole Harbour to Corfe Castle and the grey line of the Purbeck Hills in the distance.

The problems that face Mr. John Scrimgeour are representative of those faced by many of the smaller growers in the industry, and it is for this reason that we thought a visit to Huntick Farm should be of interest to a wide circle of readers. Here is no mushroom "factory", with tight schedules, stopwatches and the incessant din of fork lift trucks racing to keep up with the programme. But if the tempo is slower, it does not mean that there is a lack of efficiency and Mr. Scrimgeour has introduced a number of original ideas on his farm that might well be copied by other growers—even some of the bigger ones.

As an example of his ingenuity, we would mention the corner-pegging of his trays. Cropping is carried out in trays, fishboxes being used, and in each corner of the tray two galvanised steel straps are secured, running diagonally across the corner. The pegs are of triangular section and can be slipped quickly into position behind the straps when the trays are being assembled, and as quickly removed after cropping.

The advantage of the method lies in the fact that the trays can be close-stacked for storage or peak-heating, yet by inserting the pegs, they can be open-stacked for cropping. When the fish boxes are due for scrapping, the pegs are available for use in new trays after sterilisation.

Another problem tackled by Mr. Scrimgeour with vigour—and, we

The curing shed is large and airy, and capable of keeping up with expansion in the growing units.

The dam, with Mr. Scrimgeour closing the door of the main pump house.

may say, with some considerable imagination!—is the question of water supply. The nearest water main is over a mile away and when he bought the farm he found that all the water came from a single well which usually gave little water in the summer. This had not worried the previous owner, who was an arable farmer, but was of great importance to a mushroom grower.

To bring the water by main to the farm meant considerable expense that would have taken years of successful cropping to write off. The alternative that occurred to Mr. Scrimgeour was to build a dam.

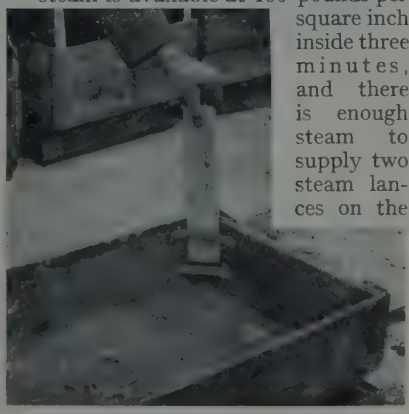
In one of the fields close to the farmhouse there was a re-entrant that gave every indication of carrying water away, if not on the surface, at least underground. He took expert advice, and was assured that a dam across the bottom of the gully would fill with water. All the same, the prospect of laying out £600 on the dam with only a theoretical prediction that it would fill with water gave Mr. Scrimgeour some moments of anxiety!

Six feet of concrete went into the foundations and another six feet of wall on top of that, with an overall width of 100 feet, completed the project. Once the dam was constructed, he could only sit back and wait.

Now the dam holds 25,000 gallons of water—enough to see him through the longest drought. There is a main pump at the dam, pumping water to two storage tanks, one sited for providing water for the mushroom houses and the other adjacent to the composting shed.

The farm is heated by hot water pipes and there is no steam "on tap". But the lack of this essential commodity on the modern mushroom farm has been countered by an ingenious equipment known as the Weaver Steam Cleaner. The Steam Cleaner is mounted on a tricycle undercarriage that permits one man to move it quickly about the farm, and all that is required to bring it into action is an electric power point and a supply of water.

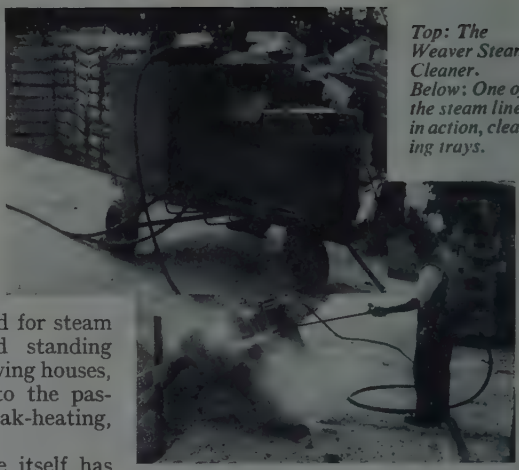
Paraffin provides the fuel that is forced into the jet by an electric pump. From a standing start high- pressure steam is available at 100 pounds per square inch inside three minutes, and there is enough steam to supply two steam lances on the



The trays, showing a corner peg being inserted into the slots in one corner.

ends of high-pressure hose.

Steam is used mainly for thoroughly cleaning and sterilising the trays between crops, the jet of steam at 212° Fahrenheit literally scouring the insides of the trays, blasting away any trace of spent compost or mycelium. Additionally, the Steam Cleaner is used for steam washing the floors and standing equipment inside the growing houses, and also for a boost into the pasteurising house during peak-heating, if required.



Top: The Weaver Steam Cleaner. Below: One of the steam lines in action, cleaning trays.

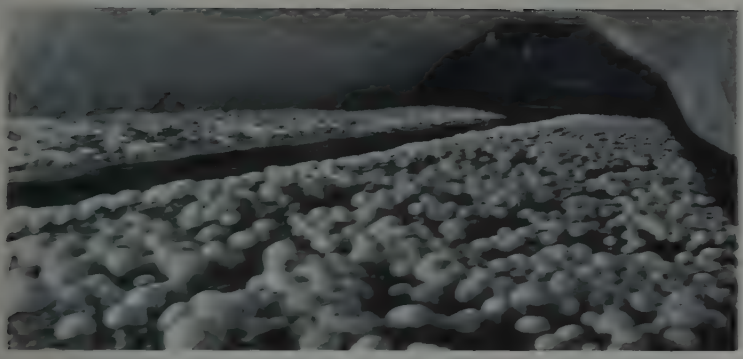
The pasteurising house itself has forced draught ventilation, with one line of ducting at roof height and the other line at ground level on the opposite side of the house. The air is forced into the house with the aid of an ex-Government Tornado blower that has the added advantage of being mounted on small wheels, so allowing it to be detached from the ventilating system when necessary and used for growing house ventilation through polythene ducting.

It is, perhaps, the cropping houses that will provide the main point of interest to the smaller growers, for Mr. Scrimgeour thinks that he has solved a problem of erecting a dual purpose house that could be quickly changed to provide cover for an alternative crop. Glasshouses are by far and away the cheapest method of covering ground for a crop of mushrooms, although naturally they must be expensively adapted to provide the ideal conditions for mushroom growing.

Mr. Scrimgeour has put up mobile glasshouses. Their advantage over fixed glasshouses lies in the fact that they can be moved into the alternative position which would be over cultivated ground. The houses move on rollers running on rails, and in one position stand on concrete for mushroom growing while in the second position they stand over open ground.

The advantages are not only cheapness of construction, but also the ability to use the houses for an alternative crop such as lettuces when it is desired to rest them from mushroom growing. The prevalance of certain insidious diseases makes every grower wish he could rest one or more of his houses for a few months, but with the purpose-built house this can only be done by allowing the house to be idle.

A description of Huntick Farm would not be complete without reference to the old farmhouse itself. While retaining its character, Mr. Scrimgeour has turned it into a beautiful home, and the interior decorations by his wife would be a credit to some of the famous names in that line of business!



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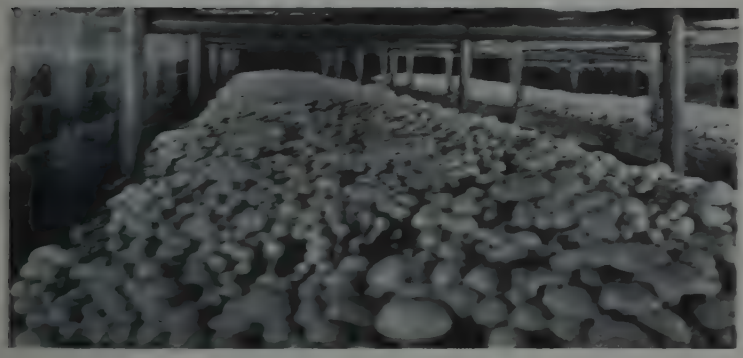

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SOMERS & GIBSON, LTD., Smithfield Market, Manchester 4. Tel.: Deansgate 3666. Telegrams: Muscatel, Manchester.

FRED BRIDGE, Smithfield Market, Manchester 4 Tel.: Deansgate 4835 & 2802. Telegrams: Fred, Bridge, Manchester. Established 1888

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